PROC. BIOL. SOC. WASH.
91(4), 1978, pp. 929–935

STUDIES ON SPIROBOLOID MILLIPEDS. XII. THE STATUS OF *SPIROBOLUS NORONHENSIS* POCOCK, 1890, AND SOME RELATED SPECIES (PACHYBOLIDAE)

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Abstract.—A new genus, *Atlanticobolus*, is proposed for the single species *Spirobolus noronhensis* Pocock, which is known only from the original collection made on Ilha Fernando de Noronha in the 1880s. This species is a dwarfed member of the family Pachybolidae. It is closely related to several spiroboloids described from West Africa, particularly to three which are referable to the genus *Amblybolus* Keeton, 1964 (=*Tonkouibolus* Demange & Mauries, 1975, syn. nov.!). Affinity of *Atlanticobolus* and *Amblybolus* with *Centrobolus* (Cook, 1897) is suggested.

Spirobolus noronhensis must qualify as one of the least-known species of millipeds: to the best of my knowledge it has not been mentioned in the literature since the name was published almost 90 years ago. The description provided scarcely more than ordinal characters, and since the type material originated on a small island off the Brasilian coast it had long been my presumption that some small well-known synanthropic milliped probably bore the name *noronhensis*.

When I was able to study the original material in the British Museum collection during the summer of 1977, I was agreeably surprised to discover that Pocock's enigmatic little species has apparently not been either previously or subsequently described, and that, moreover, it is not referable to any of the currently recognized spiroboloid genera.

A survey of the literature disclosed some obviously related species, some interesting biogeographic implications, and (as usual in diplopod taxonomy) suggestive leads to be followed up by someone having the opportunity for revisionary work on these small spiroboloids. For the present I must be content to record the pertinent details about the identity of *noronhensis* and some inferences about related forms extracted from reliable literature sources. Anything further would probably have to be preceded by a revision of the entire order.

I am very much obligated to Keith H. Hyatt, Esq., for permission to work in the collection of the British Museum (Natural History). This research was supported by grant BMS 75-04860 from the National Science Foundation.

Family Pachybolidae Cook

Following the traditional classification of spiroboloids first proposed by Brolemann in 1913–1914 and variously modified in recent years, those species

in which the posterior gonopods are basically oriented parallel to the median body axis and joined medially by a distinct sternal remnant are referable to the suborder Trigoniulidea and its single family Pachybolidae. Earlier classifications admitted three trigoniulid families, but these were distinguished on the basis of rather tenuous and subjective characters of the gonopods, and may be better disposed for the present as subfamilies.

Spirobolus noronhensis is manifestly a pachybolid in this broad sense, but is representative of a rather distinct group of species unified by small body size, reduced segment number, and somewhat simplified form of the gonopods. Almost certainly this group deserves formal recognition as a tribe or subfamily, the more so since its known components are distributed in a way suggestive of a cohesive, amphiatlantic, geographic pattern. Aside from the several genera here accounted, a possibly related taxon is the South African genus *Centrobolus*, in which the posterior gonopod is prominently articulated near midlength, and in which some species are known with as few as 38 segments. In those which have been studied for the character, however, the posterior gonopod sternum is present, and at least in the species that I have seen, the side of the head is not modified as an antennal groove as in *Amblybolus* and its near relatives. Still, *Centrobolus* should certainly be taken into account when the status of these "amblybolines" *vis-à-vis* other pachybolids is eventually estimated.

In addition to the four species definitely known to be members of this group, it seems highly probable that at least some of the small spiroboloids described from Cameroun by C. O. von Porat in 1893 and 1894 will be found referable to *Amblybolus* or a related new genus. The several species recorded from central Africa under the generic name *Brachyspirobolus* are similarly small and one has only 36–38 segments, but the form of the gonopods is quite different from that of the West African species (notably the posterior gonopod lacks articulation at midlength) and no especially close relationship can be asserted.

The two genera which I now recognize in this section of the Pachybolidae may be easily distinguished by the following contrast:

Temporal region of head capsule deeply depressed laterally, forming an antennal cavity the dorsal edge of which produces a sharp rim just laterad to the ocellaria; apex of telopodite of posterior gonopod complex in structure, with a short basal process on medioposterior side, a terminal flagelliform process, and a terminal laminate lobe; no sternal remnant between these gonopods *Amblybolus* Keeton

Temporal region of head depressed as a shallow antennal cavity but without a sharply defined dorsal rim laterad to ocellaria; apex of telopodite of posterior gonopod with basal process but otherwise apically simple and laminate, with a small reflexed acicular process; posterior gonopods with a small sternal sclerite *Atlanticobolus* gen. n.

Genus *Amblybolus* Keeton

Amblybolus Keeton, 1964, Pilot Register of Zoology, card 5. Type-species, *A. mitis* Keeton, 1964, by original designation.

Tonkouibolus Demange & Mauries, 1975, Bull. Mus. Nat. Hist. Natur., Zool., 201:392. Type-species, *T. flagellatus* Demange & Mauries, 1975, by original designation. New synonymy!

Comparison of the excellent illustrations and descriptions given by the above-cited authors leaves no doubt that the two generic names are based on closely related species. In fact, one is at some pains to distinguish the two species, and future studies may show them to be only geographic races of a single species. MM. Demange and Mauries probably were unaware of Keeton's paper because of the unorthodox method of its publication.

The most obvious distinction between the three species of *Amblybolus* appears in the anterior gonopods, particularly in the form of the coxal lobes, as noted in the following key. All three have the coxae of the posterior gonopods medially in contact (no trace of sternum remains) and share the same general form of the apical modifications of the telopodite. The authors of both generic names emphasized the remarkable excavation of the head to accommodate the antennae, and in both cases suggested that their new genera probably represented a valid family-group.

Because of a delay in publication, the formal proposal of the names *Tonkouibolus* and *flagellatus* did not appear until December, 1975, but both were validated by brief indications in a paper (printed in July, 1975) in which *T. levieuxi* was described.

The three species now referable to *Amblybolus* may be distinguished by the following key based upon their gonopod structure:

1. Apex of coxal endite lobes of anterior gonopods spiniform and projecting distad beyond end of median sternal lobe *flagellatus*
– Apex of coxal endite lobes rounded, about equal in length to median sternal lobe 2
2. Coxal endite lobes apically notched; posterior lobes of telopodite large, extending nearly to reflexed inner edge of coxa *levieuxi*
– Coxal endite lobes not notched apically; posterior lobes of telopodite smaller, widely separated from inner posterior edge of coxa *mitis*

Amblybolus mitis Keeton

Amblybolus mitis Keeton, 1964, Pilot Register of Zoology, card 6, figs. 1–9. Male holotype and 64 paratypes (U.S. Nat. Mus.) from Monrovia (type locality), Mount Coffee, Muhlenberg Mission, and Bushrod Island, Montserrado Co., Liberia.

Amblybolus flagellatus (Demange & Mauries), comb. nov.

Tonkouibolus flagellatus Demange & Mauries, 1975, Bull. Mus. Nat. Hist. Natur., Zool., 201:392 (July).—1975, Ann. Mus. Roy. Afr. Centr., Sci. Zool., 212:114, figs. 170–173. Male holotype (Mus. hist. nat. Paris) from Mont Tonkoui, north of Man, Ouest Province, Côte d'Ivoire.

Amblybolus levieuxi (Demange & Mauries), comb. nov.

Tonkouibolus levieuxi Demange & Mauries, 1975, Bull. Mus. Nat. Hist. Natur., Zool., 201:392, figs. 11–13. Male holotype and seven paratypes (Mus. Nat. Hist. Natur.), from Teke, 30 km north of Abidjan, Côte l'Ivoire.

Atlanticobolus, gen. nov.

Type-species.—*Spirobolus noronhensis* Pocock, 1890.

Diagnosis.—Body small, length less than 35 mm, typically with 37 segments. Lateral side of head excavated as a shallow antennal socket but lacking an acutely edged overhang laterad to ocellaria. Clypeus with 2–2 widely separated setiferous pits. Antennae short and robust, apically with four small sensory cones. Ocellaria small, rounded. Collum of normal spiroboloid form, the lateral end symmetrically rounded, not subtended by projection from second segment. Segments virtually smooth, without scobinae, metazona slightly enlarged. Leg length less than half the body diameter; males with tarsal pads on legs back to 25th segment; prefemora with small setiferous apical foveola near end on ventral side; coxae of legs 4–6 of males with low rounded apical knobs. Epiproct short, blunt, posterior edge scarcely produced.

Anterior gonopods of typical spiroboloid form, sternum medially arcuate and prolonged as a triangular median lobe; coxae large, apically truncate, attaining same level of sternal apex, not prolonged mesad on posterior side, the telopodite broadly in contact with posterior extension of sternum (Fig. 2). No trace of proximal coxal apodemes. Telopodites of moderate size, almost entirely concealed by coxal in anterior aspect, partly overlapped laterally by reflexed lateral edge of coxa. Small rounded apical lobe present.

Posterior gonopods of pachybolid form, approximately "C"-shaped and flattened in one plane, oriented parallel to median body axis; proximal ends of coxae medially in contact, with a small displaced sternal remnant still evident (Fig. 3, S); interior of coxa with diffuse basal gland and internal

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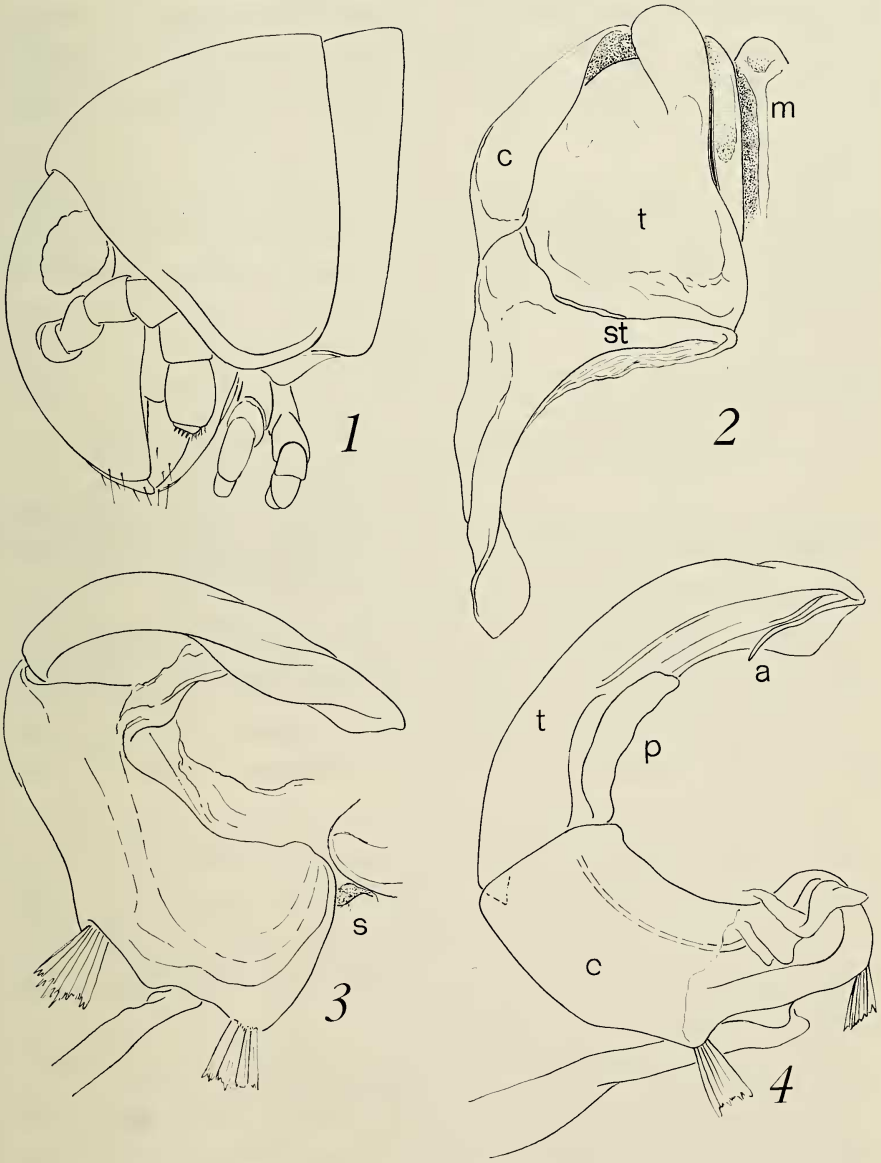
Figs. 1–4. *Atlanticobolus noronhensis* (Pocock), lectoparatype male. 1, Head and first two body segments, lateral view, showing shape of collum and antenna; 2, right side of coleopods (anterior gonopods), posterior view; 3, right phallopod (posterior



gonopod), oblique caudolateroventral view; 4, left phallopod, mesal view. Drawings made at different magnifications. Abbreviations: a, retrorse terminal process of posterior telopodite; c, coxa; m, median lobe of sternum; p, basal process of posterior telopodite; s, sternum; st, posterior median extension of sternum of coleopod; t, telopodite. Condition of the material did not permit accurate tracing of the prostatic groove beyond the posterior coxa.

duct but lacking an enlarged globose chamber. Coxa and telopodite separated by a prominent articulation at about midlength, most distinct and flexible on mesal side; base of telopodite with a large flattened, partially moveable process on inner side, remainder of segment thin, laminate, apically acute and slightly expanded, with a long, slender, reflexed acicular process (Fig. 4, A).

Remarks.—This genus is monobasic and its type species is so far known only from an isolated oceanic island east of Brasil. It is somewhat improbable that a spiroboloid genus would be endemic to such a locality, and introduction either through commerce or ocean current (Fernando de Noronha lies directly astride the South Equatorial Current) must be considered a strong possibility. Yet the species itself remains to be discovered on the African continent or in South America.

Atlanticobolus noronhensis (Pocock), comb. nov.
Figs. 1–4

Spirobolus noronhensis Pocock, 1890, Journ. Linnean Soc. London, Zool., 20:525. Numerous syntypes [Brit. Mus. (Nat. Hist.) Reg. No. 1888-85] from Ilha Fernando de Noronha, Brasil, H. N. Ridley *leg.*

Diagnosis.—With the characters of the genus. Specific characters will be sought in the gonopod structure should additional species be forthcoming.

Lectotype.—Adult male, 27 mm in length, 2.5 mm in diameter, with 37 segments. Segments 1–35 of virtually the same diameter. W/L ratio about 9.2%. Original coloration not evident, the specimen bleached from long preservation.

Head relatively large, moderately convex in front, general appearance as shown in Fig. 1. Accurate ocellus count impossible owing to loss of most pigment and some decalcification. Clypeal setiferous pits 2-2, all widely separated. Antennae of moderate length, articles short and robust, partly concealed by anterior edge of collum, 6th largest, suboval in shape, 7th very small and flattened, with four minute sensory cones. Gnathochilarium and mandibles without special modification.

Collum smooth and polished, lateral ends symmetrically rounded, anterior edge set off by a faint submarginal groove up to level of ocellaria.

Body segments almost smooth, metazona ventrally with horizontal striae nearly up to level of ozopores, mesozona with striae oblique, the uppermost becoming transverse and about four or five such fine parallel striae cross dorsum of each segment. No transverse sulci or sutures evident. Ozopores located at about midlength of the slightly elevated metazona. No scobinae. Epiproct short, apically rounded, not completely covering paraprocts.

Sterna smooth. Legs short, each about half as long as body diameter;

podomeres each with a single apical seta, that of prefemora set in a small subapical foveola; legs back as far as 25th body segment with tarsal pads along entire ventral length of tarsi. Legs of 4th–6th pairs with low rounded coxal lobes. Sympleuron of 7th segment simple, without raised or flared median transverse crest.

Genitalia as defined under the generic heading and of the form shown in Figs. 2–5.

Lectoparatype.—Largest female in the type series, 32 mm in length, 3.2 mm in diameter, with 37 segments. Antennae slightly smaller than in male; other external structural features agree closely with those of male.

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